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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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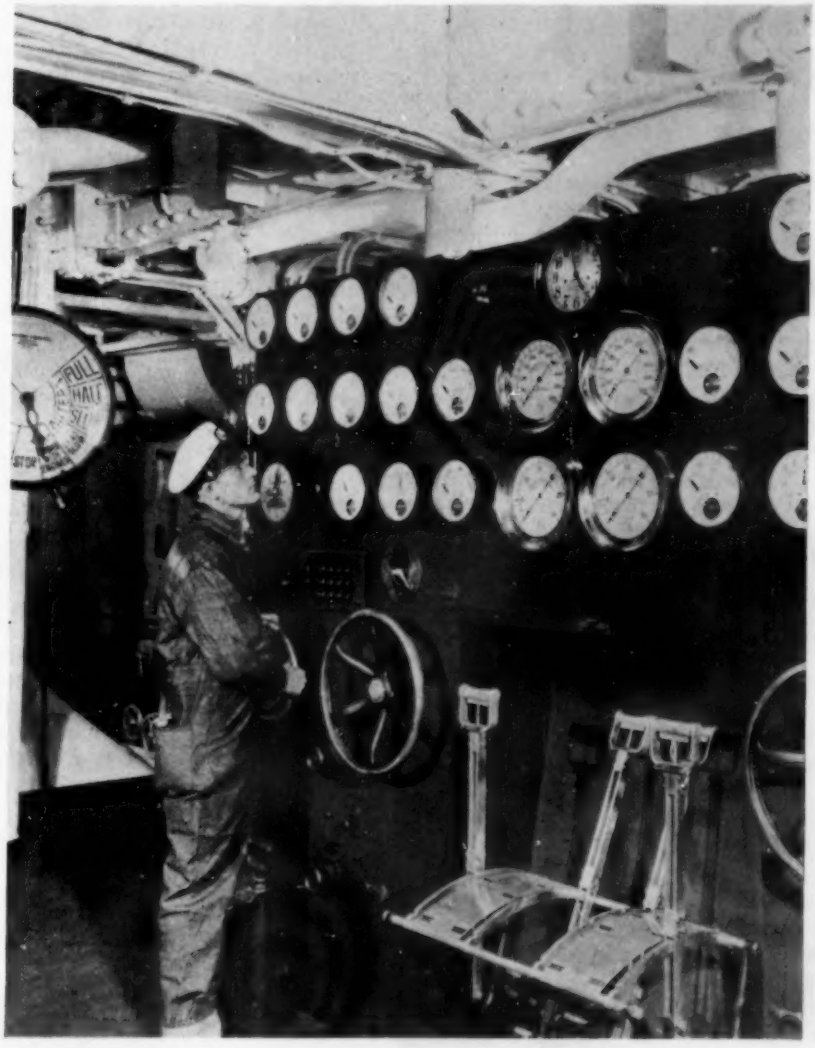

THE NEW MARINE ENGINEERING

Controlling the Electric Ship "Virginia"

(See page 82)

Vol. XVI No. 435

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Ancient Man in America

Anthropology

New evidence that human beings may have lived on this continent near the close of the Great Ice Age has been found in a cave full of ancient bone deposits in the lower slope of Bishop's Cap Peak in southwestern New Mexico, according to William Alanson Bryan of the Los Angeles Museum.

The discovery consists of the fragments of two human skulls and other human skeletal remains, mixed with the bones of many extinct mammals and birds in the sandy deposit that floors the cave. The human bones were so deeply buried and so intimately associated with the bones of extinct species of horse, camel, sloth and cave-bear, that a later intrusive interment seems highly unlikely.

The find was due to the enthusiasm of a well-trained amateur excavator, Roscoe P. Conkling of El Paso. Mr. Conkling, whose work for a smelting and refining company has taken him afield a great deal, has occupied his spare time with scientific excavations. Recently he arranged with four other men to locate and make preliminary diggings in any caves near El Paso that might be expected to yield fossil bones. Spurred in addition by a legend that the Bishop's Cap cave contained buried Spanish treasure, these men selected that place as their first venture and began digging. Coming upon bones, they thought they might be those of a mule belonging to the old-time treasure hiders, and dug more feverishly than ever.

Then they turned up fragments of the first skull, at a depth of twelve feet. Realizing at last the nature of their discovery, they reported to Mr. Conkling, who took charge of the further excavation. The second find of skull fragments was made at a depth of eighteen feet, and ten feet distant from the first. Directly between the two was the almost complete skeleton of an extinct ground sloth. All the bone material so far taken out has been removed to Los Angeles, but there is still a great deal of unexcavated earth left in the cave, on which work will be continued.

It is expected that this newest clue to man's antiquity in America will add fresh fuel to the fires of controversy that have raged about the discovery of human bones and stone implements associated with the remains of extinct animal species in other places. The most notable of these earlier finds were made at three sites in the Southwest by Harold J. Cook and J. D. Figgins of the Colorado Museum of Natural History, and at two sites in Florida by an expedition under the direction of Dr. J. W. Gidley of the U. S. National Museum. In all these places stone implements were found associated with the bones of extinct animals; in one or two insances directly underneath the bones. At Vero, one of the Florida sites, a crushed human skull, practically complete, was unearthed in the same stratum of earth that yielded bones and teeth of mastodon and mammoth.

There are two possible interpretations that can be placed on such discoveries of human relics associated with the bones of extinct animals, which have usually been regarded as belonging to the time of the Great Ice Age—a hundred thousand years ago or such a matter. One theory is that man appeared on this continent that long ago. The other is that man came much more recently, but that these animals survived, in the South at least, much longer than they have been given credit for. Whichever view finally prevails, it is expected that there will be some lively debates at scientific meetings during the coming autumn and winter.

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Heel Print Traps Spider

Entomology

A hole in the sand made by the high heel of a woman walking along the water's edge near Chesapeake Beach, Maryland, was the trap in which Herbert Barber, of the Smithsonian Institution of Washington, found a very rare tarantula known as the "Lost Atypus".

This species of spider, the scientific name for which is *Atypus bicolor*, is a velvety jet-black and the legs are bright orange. Only two specimens had ever been caught by scientists previously. One of these was found a few years ago at Plummer's Island, Maryland.

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National Park in Scotland

Geography

The wild Scottish Highlands are losing their wildness at such an alarming rate that a movement has been started for the creation of a national park in some typical portion of the Highlands as yet untouched by civilization. Already many of the highest, and once the wildest, places in Scotland have become easily accessible by motor. The main object of establishing a Highland park would be to preserve the solitude and mystery of the high and wild places of nature—to keep a portion of the Highlands in its primitive condition both as regards scenery and the fauna and flora.

The first step in the project for acquiring a national park for Scotland was taken at Glasgow early in June, when a conference of representatives of leading Scottish societies considered the matter and arranged to form a National Trust for Scotland, for the purpose of acquiring the necessary land. Already the support of the National Trust of England has been promised. At the Glasgow meeting a committee was appointed to examine further into the possibilities of the project, and to report at a later meeting.

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Why Children Are Murderers

Psychiatry

By Marjorie Van de Water

Psychologists, psychiatrists, physicians, judges, teachers, parents, and social workers have all been enlisted in the campaign to search out the elusive causes of child crime and to devise methods of prevention and cure for this evil. Many interesting theories have recently been advanced, but it is difficult to find any two authorities who agree as to the principal cause and the best method of treatment. The reason for this divergence of opinion among experts probably lies in the fact that so many different factors enter into the situation; there is no single cause which leads children astray.

The youthful killer may be insane or emotionally unstable. Dr. L. Grimberg, after a clinical study of five hundred delinquents or, as he says, "criminals in the making," makes the following statement:

"More importance ought to be attached to the emotional aspect than to the question of the mentality. It is not sufficient to determine the I. Q. and classify the delinquent accordingly. It is true that the means at our disposal for the determination of emotional stability are as yet crude, but they have given definite and satisfactory results. There is really no reason why the law should not require the use of all the scientific methods available to determine the status of an individual, when that individual comes under the jurisdiction of the law for a criminal offense. . . .

"The driving force of our actions is not the intellect. In reality, the intellect is the controlling power. The driving forces are our emotions, and their stability is determined by the condition of our endocrine system."

Dr. William J. Hickson, Director of the Psychopathic Laboratory, Chicago Municipal Court, after a twelve-year study during the course of which over 40,000 Chicago criminals were examined, has come to the conclusion that most crime is committed by individuals who are emotionally unstable. He believes that a great many are victims of dementia praecox.

Dementia praecox is a disease of youth. Dr. Nolan D. C. Lewis, a psychiatrist at St. Elizabeth's Hospital, a U. S. Government hospital for the insane, believes that the dementia praecox patient is born with the disease and that it may develop into an active phase at almost any time after birth. Definite cases have been observed as early as six years. The most likely time for the disease to become active is at the age of 14; it may come earlier than that, and frequently does not appear until much later. Unfortunately the onset of the active phase of the disease is often very sudden, and the child so seized is likely to surprise his parents and friends by suddenly making a violent attack upon a playmate or even committing murder. He would act upon a sudden impulse, with no previous warning, and perhaps with no provocation for this event.

SCHOOLS THAT GIVE A CHILD A CHANCE to "show off" in worthwhile ways remove the temptation for him to "show off" by rebelling against authority. Science recognizes this juvenile craving for attention as one of the major causes of child crime

Unfortunately, too, the early symptoms of the disease are not easily interpreted by the parents or teachers; they would be plain only to the trained psychiatrist who could give the child a thorough mental and physical examination. The child who is a victim of this disease is not ordinarily wild-eyed or raving. He has not those characteristics which are commonly associated with insanity. Quite the contrary. He becomes gradually but increasingly indifferent; he loses interest in even the most vital matters; all finer feelings are lost; and he will show no emotion at the most tragic of occurrences.

It is this type of child who may some day commit a brutal, cold-blooded crime.

Another type of juvenile murderer is feeble-minded. The child of dull mentality contributes considerably more than his share to the total of juvenile crime. It is estimated that about two per cent. of the total population are of low mentality. If the feeble-minded were no more prone to criminal tendencies than those of normal intelligence, one would expect the same proportion to hold in criminal institutions. Investigators who have given mental tests to prisoners indicate, however, that the proportion of feeble-mined among criminals is between 13.5 per cent. and 31 per cent. Even allowing for lack of cooperation among the prisoners tested, and taking into consideration the fact that probably the brighter criminals stand a better chance of escape from the law, we must consider the feeble-minded a greater crime risk than the normal person.

When the dull boy commits murder, it may be (*Turn to next page*)

Why Children Are Murderers—*Continued*

that he has been led into the situation by someone else. He is easily influenced, and will follow slavishly the dictates of a gang leader no matter to what end they may lead. Usually he has no adequate comprehension of the consequences of his acts. He certainly cannot be held responsible for what he does in the same sense that a normal child of equal age could be.

It is difficult to say that either feeble-mindedness or insanity is the cause of criminal tendencies, for undoubtedly many cases of both disabilities exist in harmless, well-behaved individuals. Students of heredity, however, recognize a definite relation between feeble-mindedness, criminality, alcoholism, and insanity. Often combinations of these tendencies appear in generation after generation of the same family.

A case which recently occurred in Alliance, Nebraska, is an illustration of a crime committeed by a feeble-minded child. The boy, who was twelve years old, stole a two-months-old infant from the automobile of the baby's parents with the intention of killing it. He took the baby into a vacant lot, stripped it, and was hunting about for a suitable implement with which to chop off its head, when he was caught and saved from committing this dreadful deed. The boy, at 12, was in the second grade in school—five years behind normal boys of his age.

Fortunately, the very dull boy is easily distinguished by those having the care of him. Mental tests are available which will give at least a rough indication of the degree of ability with which any child can meet the problems ordinarily solved by others of his chronological age. The child's progress in school is usually a good indication of his mental ability, although this cannot be relied upon to make fine distinctions between individuals. The failure of a child year after year to progress from one grade to the next usually points to mental retardation.

The dull boy when detected should be given special care from his earliest years. He should be cared for as one would care for a child of his mental age; he should not be expected to assume the responsibilities ordinarily undertaken by those of his chronological age. He should be kept busy and interested at simple tasks which he can find pleasure in doing, and should be kept away from evil influences. With such intelligent care and supervision, he can usually be brought up to be a useful, constructive citizen, unconscious of his handicap.

QUICKENED HEARTBEATS, quickened breathing are the normal reaction to emotion-stirring situations; murderers emote differently. This new emotion-tester's written record enables science to make telltale comparisons

The child slayer may have a physical defect. Dr. Max G. Schlapp, director of the New York Children's Court Clinic, and Edward H. Smith, in their recent book on "The New Criminology," place a large share of the blame for crime on the abnormal functioning of the ductless glands. These glands, which include the thyroid located in the neck, the pituitary at the base of the brain, and the adrenals on top of the kidneys, regulate the chemical composition of the body and the growth of the whole body, including the brain structure. The over-functioning or under-functioning of any one of the glands in a child may cause the upset of his whole personality. For example, the over-functioning of the thyroid makes a child high-strung, nervous, and erratic. If it fails to function the child is dull, fat, indifferent, and in many cases idiotic. The mentality and the emotions are both affected by diseases of the glands.

Epilepsy is another physical defect which probably contributes largely to child crime. When the physical effects of the epileptic fit are severe, the person affected is helpless and therefore unable to cause any harm, but Dr. Schlapp points out:

"There will be times when he will experience all the psychic effects of the disease without the physical symptoms. That is to say, he will get confused, lose control of himself, grow dizzy, lose his memory and commit the strangest acts, including ferocious murders. These attacks are of an amnesic character, for the patient usually has no memory afterwards of the event which befell him while under the spell."

The child killer may be perfectly normal. He may have become a criminal merely as the result of faulty training.

The fact that in the case of one of the child murders, the tragic incident occurred while the parents were attending a murder trial at the county seat is very suggestive. One may well imagine the conversation over the supper table, the many details being discussed, and the intense interest displayed by the parents in the crime. Such situations are, unfortunately, not rare, yet this atmosphre gives the young child the impression that crime is the sure way of attaining fame—that murder is the ideal manner in which to secure the center of the stage. Most children are dramatic. Most children have the tendency to act out the the dramatic (*Turn to next page*)

Why Children Are Murderers—*Continued*

stories they hear. Most children are anxious to secure the attention of adults and their associates in school.

Prof. Robert T. Rock, of Catholic University, who gives psychological and psychiatric examinations to juvenile delinquents and other problem children in the District of Columbia, reports that many of the children with whom he comes in contact are quite normal healthy youngsters. Their trouble is just that they have never been taught, by either precept or example, true ethical values. One boy says, "Why should I work to earn money? My brother never worked, and see what a fine car he has!"

Those who have studied the child in the light of the new psychology tell us that the young boy or girl receives only the smallest part of his education in school. He is learning from us during all his waking hours, whether we are on guard or not—perhaps principally when we are not. Probably very few parents would deliberately tell a child that it was right to evade and disobey the law, and afterwards to lie and cheat to avoid punishment. Yet in too many cases a very young boy riding on the front seat of an automobile can watch the speedometer and see his father driving above the legal limit, he sees him ride past signals in an effort to outdistance the pursuing policeman, and finally hears him lie glibly to the officer when he is overtaken. The child is like a sponge in absorbing such experiences, to be influenced by them throughout his whole later life.

Educators now believe that children begin to learn at a much earlier age than we have supposed possible in the past. Long before they can talk, they are watching the parents and receiving impressions that will later influence their behavior. A father who comes home drunk and frightens his wife by a loud voice, domineering manner, and the display of small cruelties, may give his infant son the impression that this type of behavior is ideal. In later years, although he retains no conscious memory of such incidents he may exhibit the same behavior in his relations with a younger sister or young playmates.

This sort of unconscious imitation of others is called by the psychologists, "identification." We can *consciously* imitate only one person at a time, but we can identify ourselves with any number of people. Their habits, mannerisms, ideals, and ways of thought may be adopted and made a part of us. In this way we may become a composite of all the characters who throughout our lives impress us and rouse our interest, whether the characters exist in real life or whether they are found in fiction or in the motion pictures.

Sometimes the teaching is more direct. How often we hear the expression "I'll kill you if you do that!" used carelessly before young children!

Then there is another method by which even the most well-intentioned parents may give children the wrong start. Psychologists have found that one of the first traits displayed by the young infant is the desire for attention. Probably nature has given this longing to human infants as a substitute for the ability to shift for himself which is the gift of the young of the lower animals. Certainly the lusty howl of the infant is a powerful weapon for forcing elders to produce the necessities of life. At first he uses it just for this purpose, but at a surprisingly early age he finds out that when he wakes up feeling bored or lonesome, a good strong cry will bring someone running. If this is kept up, before long he realizes that when he is good his elders go on about their own affairs and leave him alone. When he is bad, he immediately secures the coveted attention—the taking up out of his damp, wrinkled crib, the rocking, petting, and all the other known devices for soothing. The wise parent will give the child attention at certain regular intervals, preferably when he is not crying, rather than when he cries for it, thus breaking up this association of bad behavior and pleasurable results. The unwise parent will continue the same "education" throughout the childhood and boyhood of the son.

The school may in some cases contribute its share toward placing the "bad boy" in the limelight that he so strongly desires. When the boy does his school work as he should and turns in the right answers and behaves in an orderly fashion, he is unnoticed because he is like so many of his fellows. As Dr. Wilfrid Lay, a child psychologist of the new school, says, "It is an unfortunate fact that the early tasks of the school are generally those in which he (the child) is almost unable to express any individuality different from other children's. When, for instance, the same ten examples in arithmetic are given to a class of forty children, and the forty sets of answers have to be exactly the same for each child, there is little scope for individuality. If the child wishes to be individual and make his work his own and different from other children's, he must have different answers to the examples—answers which are called *wrong!*" From the wrong answers, the child may progress to wrong behavior, and in the end he may devote his whole energies toward excelling his fellows in wickedness. He then becomes the central figure in his little world. He is called to the principal's office. He becomes the subject of repeated conferences and meetings of teachers, parents, neighbors, and friends. He is taken to court and allowed to tell his story to a new audience. Perhaps he even gets his story and his photograph into the newspaper. Finally he is sent to a reform school where he learns that after all he is only an apprentice in crime, and then he sets out with new zeal to improve his technique in wrong-doing.

Crime in children is not a disease in itself. Rather it is like a fever; it may be symptomatic of any of a score of diseases that affect the mind and body and soul of the child. Those who are called upon to deal with the child offender should look behind the particular misdeed, as the physician looks beyond the eruption on a child's chest. We may then be in a position to cure or remedy juvenile delinquency as well as we now can cure the measles.

Science News-Letter, August 10, 1929

Plant "Camels"

Botany

When it comes to living without water, there are "camels" of the plant kingdom as well as of the animal kingdom, declares Dr. F. L. Pickett, head of the botany department of the State College at Pullman, Washington.

This botanist has discovered ferns and mosses in the semi-arid regions of the northwest that will live indefinitely without moisture, he says. While the ordinary plant will not grow without at least a four or five per cent. moisture content, these ferns and mosses may have their water content reduced to one-tenth of one per cent. and live in this condition indefinitely, he has found.

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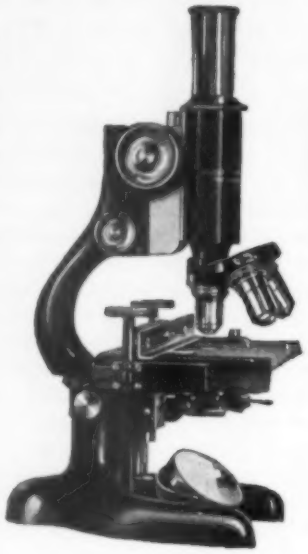

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Which Witch is Which?

Chemistry

JEROME ALEXANDER in *Journal of Industrial and Engineering Chemistry* (News Edition):

An Exorcism in Three Gasps.
Scene—A University Laboratory.

Round about th' equation go,
In the differentials throw;
Factors which assumption rules,
Based on spheric molecules.
Fix the pH sharp and well—
Naught of other ions tell,
Close your eyes, so you can't see
Effects of an impurity.
Then estimate, and calculate—
The differentials integrate.
Quote formulas or Nernst and Stokes
(Though here invoked they seem like jokes),
Combine, and blend with your results—
Sneer at the critics' keen insults.
Teach marks-men, who, whate'er you tell,
Have hollow heads to echo well.
Then let it slowly leak around,
That Nature's final truth you've found.

CHORUS OF PH. D's.

If you would see Truth, as in dreams of your youth,
Pledge your faith to fair Truth's only scion,
If radicals reason, refute their foul treason.
Be loyal to Hydrogen Ion—
Shun chlorides and citrates, and bromides and nitrates,
For their rule is misleading and mean—
H-Ion is King, and he rules everything—
Hydroxyl we praise as his Queen!

CHORUS OF HARD-BOILED EGGS

If figures don't lie, liars figure, I ween,
With swift-writhing Ultimates no one has seen—
Many ions the milieu rule.
Divalents are bad, and trivalents are worse,
Tetravalents, like Lanthanum, always a curse—
For Dame Nature you never can fool.

To us, Mathematics' a wicked old witch,
Whose conclusions are sometimes a joke—
Thus, statistical averages show that I'm rich,
But my bank account proves that I'm broke.

Character Test in Edison Questions

Psychology

The Edison scholarship examination is not what psychologists would call primarily a test of aptitude or inborn bent for inventive work.

It combines the general information test made famous by Edison several years ago with the old-style scholastic examination in physics, chemistry, and mathematics. A novel feature of the examination consists of a few questions testing character and judgment. Testing character in this way rather than by testimonial is a modern development which has come into use along with the modern psychological examinations first brought into prominence by the Army Intelligence Tests.

No use was made of what is perhaps the latest method of examination, now used in college entrance, Civil Service, and employment tests of the newer sort. This is called the "short answer test". It saves the applicant work and at the same time allows precise and uniform grading of all the examination papers. Such new style test questions can be answered by "Yes" or "No", or by marking one of several given possible answers. Psychologists are interested in the fact that Edison did not use this method, as it is considered the simplest and most efficient form. It also makes the test independent of the person's ability to express himself in English and, since the scientific ability or inventive genius is not necessarily related to fluency in English composition, it would have eliminated a handicap to some.

Although many mechanical ingenuity tests, such as assembling block and wire puzzles or putting together simple pieces of machinery, have been devised, the Edison test did not, so far as announced, include similar problems. The tests made with physical apparatus rather than pencil and paper have been found to be valuable in picking those with imagination and reasoning ability useful in careers of invention and mechanical construction.

The first part of the Edison scholarship examination contains questions of the sort with which any school boy is familiar. They might have been taken from any college examination or from the entrance examinations for Annapolis or West Point. The following is typical:

"Define work, energy, and power, and give an illustration of each. How does weight differ from mass? How does force differ from energy? Would a body weigh more or less on the moon than on the earth? Why? Where would bodies weigh nothing?"

The questions in part two are more novel. They are designed to give the examiner an insight into the character and mental make-up of the boy examined. Some test ingenuity. Some measure ethical judgment. Some are designed to bring out the boy's ability to look ahead into the future. Here are some that probably no two people would answer in the same way.

"What new (*Turn to next page*)

Test Your Inventive Bent

Psychology

Do you have the "divine spark" necessary for a great scientist or inventor, of the Edison type? Psychologists believe that scientific aptitude is born in specially gifted individuals instead of being acquired by training. Perhaps, if you had the opportunity, you too could be an inventor or scientific wizard.

Here is a test that you can try on yourself. It is especially prepared by a Science Service specialist, but it is similar to other tests devised by psychologists to single out the few embryo scientists from among the thousands of "just ordinary folks". Compare it and your ability to do it with your success in doing the tests that Mr. Edison gave the 49 aspirants for the Edison scholarship.

All you need is a pencil and a few minutes of time. Do not look at the answers before you finish. Anyone can take this test. It is a measure of your natural "bent", not any special training or technical knowlelge.

Ready? Begin!

1. Which of the following is the *best* definition of a thermometer? (1) a glass tube containing mercury. (2) an instrument used in laboratories. (3) an instrument, usually employing mercury, for measuring temperatures. (4) an instrument in common use in many homes and offices.

2. How many people in the United States earn their living from science today?

3. Suppose you were making an experiment and wished to know very exactly the weight of the substance you were using. You weighed it several times and got the following results: 12.25 oz., 15.75 oz., 12.50 oz., 12.25 oz., 12.00 oz. What is most probably the correct weight?

4. Suppose you wished to know the contents of a tank from which several of your co-workers were drawing supplies of a certain liquid. You could not actually measure the liquid but you have the following facts at your disposal. Which of the facts would be important for your computation? (1) Total capacity of tank. (2) Number of persons using liquid. (3) Number of days since tank was filled. (4) Total amount drawn from tank since it was full. (5) Average daily evaporation. (6) Density of the liquid. (7) Frequency with which tank is filled.

5. Read each of the following statements and decide whether it is consistent throughout. (a) Moisture causes wood to swell. Today is a very damp day and therefore the wooden peg can be more easily driven into the hole made for it. (b) Accuracy is essential to scientific work. Measurements made by different individuals seldom agree exactly. In order to insure accuracy, scientific data should be checked by more than one person.

6. Suppose two handbooks differed as to the best procedure for working out a certain experiment that you wanted to conduct. If you had plenty of time which of the following would you do? (1) Use a compromise procedure. (2) Go to a good technical library and try to find a third handbook. (3) Forget the handbooks and work out a procedure of your own. (4) Try out both the methods recommended and find out which is best. (5) Call up some expert on the subject and ask him for the best procedure. (6) Decide on one of the methods given and then follow it, ignoring the other.

7. Suppose you were driving in the country and your radiator sprung a leak. You had no equipment for repairing it, and there was no garage within miles, nothing but a small refreshment stand. What could you do, if anything, to lessen the leak until you got back to town?

Have you finished? If so, turn to page 83 for the answers.

Planes Displacing Ancient Transport

Aviation

In a matter of months, commercial aviation has made remarkable strides in Mexico and other parts of Latin America.

Small private lines that were plying trade in isolated spots are now linked, and today a net of airways is enmeshing all America very rapidly.

One can fly from the Texas border to the oil fields at Tampico, Tuxpan, or to Mexico City. From Vera Cruz there are lines to the Isthmus of Tehuantepec or to Tapachula on the Guatemalan border, or to Yucatan via the almost unknown coast of Tabasco and Campeche, forgotten since the pirates were driven off the Spanish Main. A branch line from Merida will soon cross Yucatan and Quintana Roo to Cozumel, over territory inhabited by hostile Indians where no one has ever been welcome. The Guatemalan government has a line from Guatemala City to Flores, in the inaccessible Department of Peten, where the Maya Indians from Chichen Itza took refuge when their empire fell in northern Yucatan.

Mexican airlines from Tapachula in the south will soon be extended to Guatemala City, and mail will go from Texas to Guatemala in twelve hours. From there the Republic of Salvador and the Pacific side of Nicaragua will be linked with the Atlantic side by other units of the Pan-American system. Today one flies from Florida to Santiago, Chile, if one likes, and by fall one will be able to continue the journey across the Andes to Buenos Ayres, if aviation officials' plans come true.

Aviation in the United States, and aviation in the rest of America to the south, are of very different character. In the United States flying has merely supplemented or speeded up already existing excellent means of communication. In Mexico and other parts of Latin America good roads are even scarcer than railroads, and the airplane has jumped a broad gap in the development of transportation. Airplanes serve where often there has been no other means of communication at all before.

Mexico, like other Latin-American countries, is a living museum demonstrating all stages in the history of transportation. The trimotor plane for Tampico flies overhead following the railroad past Teotihuacan, the ancient Toltec city of pyramids that is a landmark from the air. The tourist's automobile from Mexico City forces the Indian's burro off the village street in modern Teotihuacan.

The burro, loaded out of sight with sacks of charcoal burned in the mountains, is the Spaniard's most human gift to the Indian, and his only beast of burden. Before the burro came to him, as if out of heaven, the Indian carried everything himself, and in the course of thousands of burroless years he had developed the art to a fine point.

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Edison Questionnaire—*Continued*

discovery or invention do you believe would be the greatest benefit to mankind? Why?"

"If you had been given a certain experiment to perform and had been informed that it could be done successfully, but you had failed ten times, what would you do?"

"If you were to inherit $1,000,000 within the next year, what would you do with it?"

Part three is the old bugbear that has afflicted everyone who has ever applied for a job or attended business school. "Assuming that you have just graduated from high school and are anxious to land a job, write a letter——" You know the rest of it.

Part four is mostly the test of general information that Mr. Edison has relied on so much in the past. At the end, however, are two posers which do not come under this classification. Volumes might be written about them. Take a long pencil and try it yourself.

"What, in your opinion, should be done to improve the airplane?"

"Do invention and industry promote international agreement?"

Altogether there are 56 questions besides the letter writing test. If each one was answered fully and conscientiously, Mr. Edison should be able to obtain from them a good insight into the "inner mechanisms" of his applicants.

Yet those familiar with the problem of modern employment procedure would hesitate to use this type of examination as a regular means of selecting men. They would question the possibility, for example, of giving any definite numerical rating to the answers of some of the questions. Suppose one boy thinks the new oil-burning motor is the key to improvement in the airplane. Another believes that a new alloy for making the frame is more important. Who can say which should get the higher mark? And how much higher?

Science News-Letter, August 10, 1929

"PFS" for "SS"

Navigation

Manufacturers of powdered fuel systems for ocean vessels have proposed that the prefix "PFS" should be used instead of "SS" with the name of a steamer using powdered coal as fuel. The builders of motor ships already have substituted the letters "MV" for the famous "SS" on their ships.

Science News-Letter, August 10, 1929

Canada is now shipping muskrats for breeding purposes to France, Great Britain, Germany, and Czechoslovakia.

Chameleonic Fence Post

Chemistry

A man's puzzlement over a fence post which he had painted black but which turned white every night was the starting point of a program of research which has culminated in the discovery of a number of chemicals having this remarkable chameleon-like property scientifically termed phototropy. Information regarding these chemicals has now been made public by the American Chemical Society.

The famous fence post was painted with a "pigment having a zinc basis." It would turn black soon after sunrise each morning, only to turn white again when darkness came. Many explanations have been given for the phenomenon, but scientists are not yet agreed as to the cause of it. They have, however, found several other substances besides the zinc sulfide, which was in the paint on the post, that will also change color with the light.

Most of the known phototropic liquids are solutions of colorless derivatives of certain dyes. The solutions are practically colorless in the dark, but turn the color of the parent dye when exposed to light.

Science News-Letter, August 10, 1929

Government leather specialists state that our domestic hide supply is falling shorter and shorter of meeting the leather requirements of the country.

Pulsating Earth May Change Quakes

Geophysics

A slow pulsation of the earth, causing it to get a little stouter, then a little thinner, may be the cause of a shift of the centers of earthquakes away from the equator during the twentieth century. This is the theory advanced by Prof. T. Terada and Dr. S. Miyabe of the Tokyo Imperial University, to explain a slow change in the latitude of earthquakes.

Successive earthquakes in Japan recently have shown a tendency to get farther and farther north, so the two investigators searched the records to see whether anything like this had occurred in the past. They found that during the sixteenth century earthquakes in Japan and Eurasia moved south, while those in South America moved northward, or, in other words, they all tended to approach the equator. About 1600 this tendency was reversed, and they receded from the equator. By 1700 the Eurasian earthquakes began to move southwards again, while those in South America began a new northward march shortly afterwards. About 1800 the reverse tendency again appeared. Approaching 1900, the Eurasion quakes again moved south and the South American ones north, but just about 1900 they again went into reverse. Quakes in North America also moved approximately the same way as others in the northern hemisphere.

Two astronomers, Dr. E. W. Brown of Yale, and Dr. W. de Sitter of Leyden, Holland, have studied the unexpected shifts of the moon from its predicted positions, which might affect the position of the earthquakes, so Dr. Terada and Dr. Miyabe compared these curves with those for the earthquakes. Though there is a rough agreement, they think it more likely that the earth itself pulsates over a long period. The earth is not a perfect sphere, but bulges a little at the equator. This bulge might increase and decrease, think the Japanese scientists. The greatest stress would be produced in the middle latitudes, and would manifest itself as earthquakes, and in some way the pulsations might cause a shift in the centers of the earthquakes.

Such studies as these, teaching scientists how and where earthquakes occur, may eventually help them to predict earthquakes, and so reduce their danger.

Science News-Letter, August 10, 1929

Stone Age Men Had Files

Engineering

The file is by no means a modern tool, according to Dr. Otto Dick, German engineer of Esslingen-Wuerttemberg. Stone-age men had files closely resembling in shape the present-day triangular files, which they made out of flint by hacking rough places on the surface. These instruments served them in shaping articles of horn, bone and other materials.

As far back as 3000 B. C. there were copper files, which were succeeded first by bronze and then by iron. Until comparatively recent times all files were cut by hand; the German city of Nürnburg was especially noted for the skill of its filemakers.

In 1503 the many-sided genius Leonardo da Vinci invented a file-cutting machine. Other early inventors followed his example, but it was not until after the Industrial Revolution that machine manufacture of files became a practical art.

Science News-Letter, August 10, 1929

A survey indicates that large families drink less milk per person than small families.

Distemper Conquered

Veterinary Medicine

Dog-lovers all over the world will be overjoyed to hear that dogs can now be kept free from the terrible scourge of distemper which has in the past been responsible for such heavy losses.

Dr. G. W. Dunkin and Dr. P. P. Laidlaw, working at Mill Hill for the Medical Research Committee in cooperation with the Distemper Research Council in London, have carried out an investigation of the virus that causes distemper, and after prolonged research have been able to prepare a special vaccine which protects dogs from distemper. Over 1,000 animals have now been inoculated with this vaccine, and the results have been strikingly successful.

In this part of the work the investigators have had the cooperation of many masters of foxhounds. In the Warwickshire pack 44 inoculated hounds were exposed to infection and none took the disease; 91 uninoculated hounds that were kept with them took distemper and 49 died. In a kennel of Dandie Dinmonts, 52 puppies were inoculated and remained free from distemper.

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Nature Ramblings

By Frank Thone

Chimney Swift

Most of us call them chimney swallows, but to be meticulously accurate we should call them swifts. Swifts are related to the swallows, but differ enough to be put into a separate group. One striking distinction is that swifts are unable to perch on a wire or twig as swallows do; their feet are so constructed that they can rest only by clinging to a vertical surface, such as a wall, while they brace themselves with their tails, woodpecker-fashion.

The chimney swift offers an interesting example of how one animal can adapt its life habits to take advantage of opportunities offered by the invasion of a new species. When the white man, who from the bird's point of view, is just another neighbor animal, came to this country and put up tall, cavernous chimneys, the chimney swifts unanimously agreed that these beat hollow trees all hollow; and now no self-respecting swift will build in a tree if a chimney is to be had. It is only in the backwoods, where houses are few and factories fewer, that they still inhabit hollow trees. The change came early, too; more than a hundred years ago the pioneer American bird student, Audubon, noted it.

The chimney swift would be very much "up against it" if it had to build its nest on the vertical insides of chimneys with no more technical resources than those possessed by robins and wrens. But the bird secretes some sort of a gluey substance that hardens on contact with the air, and cements the structure of twigs together and holds it firmly to the bricks.

Like the swallows and the nighthawks, swifts are exclusively insect eaters and do all their feeding on the wing. Their beaks are short and insignificant, but their mouths are wide and gaping, so that with their high speed and maneuvering power they can nab their prey as neatly as any entomologist with his net.

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Volcanoes Said to Put Salt in Ocean

Volcanology

The 485 known volcanoes of the world, discharging every year more than a hundred million tons of hydrochloric acid, supply the chlorine that keeps the ocean salty. This is the opinion of Dr. Thomas A. Jaggar, director of the Hawaiian Volcano Observatory at Honolulu. Even though the amount of hydrochloric acid gas in steam from volcanoes is almost negligible, the ceaseless emission of this steam puts the gas into the air, and thence into the rain. With the average rainfall of about 40 inches a year the world over, rain water would only need to contain about one part of chlorine in five million to supply the ocean's needs. This chlorine unites with the sodium brought into the sea by the rivers and forms sodium chloride, or common salt.

The volcanoes of the Katmai area in Alaska alone supply about one per cent. of the hundred million tons of hydrochloric acid gas needed. Even the great Hawaiian volcano Kilauea, the steam of which contains only a trace of the gas, contributed something like thirty thousand tons a year, Dr. Jaggar said. And in addition there are many unknown submarine volcanoes, each of which is doing its bit.

Dr. Jaggar also explained the presence of calcium carbonate, which is the same as marble, in sea water.

"This is secreted from the water in the body of globigerina, a tiny organism ceaselessly dying and depositing billions of skeletons that make chalk on the ocean bottom. Locally the ocean floor is built up a foot per annum. Ten thousand years would shoal the ocean, but there have been millions of years, and the ocean is still deep.

"But though globigerina is everywhere in the upper waters, two-thirds of the seabottom has no chalk. What could account for chalk banks being absent? The chalky bottoms are where the ocean is not so deep. It was found by Dr. J. Stanley Gardiner, professor of Zoology at Cambridge University, that where the ocean is more than two and a half miles deep, where the pressure approaches three tons per square inch, sea water can readily dissolve the chalk skeletons. And so, with the circulation of the oceans the lime salts are brought back and secreted over again by the live organisms."

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Ultra-Violet Rays Show Age of Statues

Physics

The uncanny skill with which X-rays have sorted out paintings of old masters from upstart modern copies may now be duplicated by ultra-violet rays working in the field of sculpture. In a series of tests made by the Metropolitan Museum of Art, pieces of old Carrara marble were compared with freshly cut Carrara under the ultra-violet light. A decided difference in color was noted.

Pieces of marble statues, some antique, some known to be modern or fraudulent, were then put to the ultra-violet test, and in every case the rays gave the same verdict that experts had reached by careful observation. One Roman portrait head of a young girl was immediately condemned by the lights. On checking the record of this statue it was found to be a modern work by Dossena, whose success in imitating antique sculpture has caused much excitement in art circles. The surface of the head had been altered by baking the marble and then pitting it with a ragged stone, but the powerful light could not be fooled by recently cut marble. Further, the test showed that the three portions of the broken statue are all of the same age, which settles the argument that part of the figure might have been old and the rest supplied by a modern workman.

When the rays were turned on some fifteenth-century marbles they detected breaks in the stone that had been long ago patched and painted so skilfully that experts had never noted the repairs.

Great usefulness for the ultra-violet light in this new field is predicted, but the museum experts warn that there will still be need for careful judgment and experience in interpreting the facts that the light may reveal.

Science News-Letter, August 10, 1929

The Electric Ship

Electrical Engineering

"Marine electrical engineering" is the new branch of engineering science required by the advent of electric propulsion for ships. Our cover shows the control room of the electric ship "Virginia," in service between the Pacific and Atlanic coasts, via the Panama Canal.

This ship and the "California", sister ship, is owned by the Panama Pacific Line of the International Mercantile Marine Company. Both are electrically propelled and otherwise electrified throughout, and are the largest American-built steamships in the world. They are also the world's largest electrically-driven commercial vessels.

They have power plants consisting of two 6,750-horsepower turbines, each driving an electric generator, and the propulsion motors are each rated 6,750 shaft horsepower.

Science News-Letter, August 10, 1929

New Fossil Elephant

Paleontology

Fossil remains of a pre-historic animal resembling a mastodon, yet somewhat like a modern elephant, are now being obtained near Arkansas City, Kan., by H. T. Martin, curator of paleontology, at the University of Kansas. The specimen is to be mounted and added to the University's museum of fossils.

The specimen is declared to be of especial scientific interest by L. B. Roberts of Kansas City, who accompanied the Roy Chapman Andrews expedition to the Gobi desert, and who has examined the first bones recovered of the Arkansas City find. He is of the opinion that it may prove to be the long-sought "missing link" between the mastodon and the elephant. Whether or not it is a unique specimen, it is declared to be in an unusual state of preservation.

The skeleton was discovered by a telephone lineman, who was excavating for a pole. When he found he had penetrated the skull of an animal, he notified authorities at the University, and Mr. Martin, who was in the western part of the state on his annual summer fossil search, went at once to Arkansas City, and transferred activities there.

The palate of the skull is almost perfect, and two teeth remain—a rather unusual condition. The tusks measure eight feet in length.

Several weeks will be required to excavate the fossil, and the better part of a year will be needed to complete the mounting at the university.

Science News-Letter, August 10, 1929

Smelly Gas May Save Lives

Physics

Addition of a smelly gas to the nearly odorless methyl chloride, which has caused a few deaths from leakage from automatic refrigerators in various parts of the country, may be one means of preventing further accidents of this nature. So says a joint announcement of the U. S. Public Health Service, the Bureau of Standards and the Bureau of Mines, just issued. Other remedies suggested are the entire replacement of methyl chloride with less dangerous gases, or the mechanical improvement of the refrigerating systems so that the gas will not leak into rooms used to sleep in. However, compared with the great number of refrigerators in use, the number of accidents has been very small, it was stated.

All these refrigerating systems make use of a gas or refrigerant in the coils of the machine. Ammonia, sulphur dioxide and methyl chloride are the most popular.

"None of the three refrigerants mentioned, ammonia, sulphur dioxide or methyl chloride, can be breathed with impunity, but none are violent poisons when breathed for a short time in low concentrations," says the report. "If the same amount of the three substances is considered, methyl chloride is the least poisonous of the three; but because their physiological effects are quite different it is hard to make a quantitative comparison. Sulphur dioxide and ammonia both have strong odors which are easily recognized and are so irritating that no one is likely to breathe much of them if escape is possible. Methyl chloride has a slight and rather pleasant odor, which would probably not awaken a sleeping person and might not be recognized by one who was awake. To this fact can be attributed any greater hazard from methyl chloride than from other commonly used refrigerants."

The report emphasized that the gas used as a refrigerant has nothing to do with the fuel gas used to run certain types of refrigerator. In all types in which a flame of illuminating gas is used to heat the refrigerant, the latter is ammonia. In most of the electric types, where a motor compresses the refrigerant, sulphur dioxide is used, though a few makes use methyl chloride. It is the latter that present any danger, especially where used in a large plant to supply a number of apartments.

Science News-Letter, August 10, 1929

Heart Disease Less Fatal to Young

Medicine

Heart disease is taking fewer and fewer lives among the younger people of our country. While the general death rate from this disease is rising, figures collected by the Metropolitan Life Insurance Company show that this increase is chiefly among older people. In the younger age groups, up to 45 among men and up to 65 among women, distinct improvement in the cardiac death rate has occurred during recent years.

This encouraging decrease is evidence of the strides made in controlling diphtheria and scarlet fever and of the better and more intelligent care given to infectious diseases, including rheumatism, to diseased tonsils and to dental hygiene, officers of the company believe. The preventive aspects of heart disease are chiefly concerned with early life and are most effective then. Heart disease usually kills after 45, but it is during childhood that it is most often acquired.

At present over 225,000 persons die of heart disease in this country every year. However, another encouraging factor in the picture is that much of the increase in heart disease deaths after age 65 is probably the result of change in style of reporting deaths. Where formerly the physician would have given old age as the cause of death he now gives heart failure or cardiac degeneration. About 80 per cent. of the cardiac deaths occur in the age range above 65. At this age degeneration of the heart is more a natural than a disease process. Degeneration of the heart, kidneys and blood vessels is characteristic of old age and tens of thousands of old people die of such conditions every year. A great many of these deaths are therefore really the result of senility in which the heart impairment is merely an accompaniment of the breaking down of the other organs. But if the physician states on the death certificate that there is cardiac degeneration, these deaths are classed under heart disease in the mortality statistics.

Science News-Letter, August 10, 1929

Answers to Test

Psychology

(Stop! If you have not taken the test, do not read further, but turn to page 79.)

Answers: 1. (3); 2. There is no correct answer to this question. It is designed to determine whether you tend to make guesses or "snap judgments"; 3. 12.25 oz.; 4. (1), (3), (4), (5); 5a. inconsistent, 5b. consistent; 6. The answers to this question cannot be rated right or wrong, but they indicate whether you have a bent for experiment or research in books, or whether you are inclined to depend on the opinions of others; 7. Any reaonable plan is given credit, the question is a test of ingenuity when faced with a difficult situation.

Science News-Letter, August 10, 1929

Poison in Silver Polish

Toxicology

The shiny, freshly polished spoon or fork may not be the best one to pick out in a cafeteria or hotel dining room, it now appears. A number of cases of acute cyanide poisoning have been traced to polish used on table silver and other metal kitchen or eating utensils in various hotels in New York, the State Department of Health has just reported. No deaths have been reported so far, but a number of persons have been made ill.

When several cases of illness, apparently food poisoning, were reported occurring in persons who had dined at an upstate hotel, health officers began investigations, following every clue that might lead to discovery of the guilty substance that had caused the illness, whether food or germ. They found that the hotel's silver had just been polished. Chemical analysis of the silver polish used showed that about one-fifth of it was composed of poisonous sodium cyanide. Further investigations disclosed that other hotels and restaurants in the state and in New York City were using this or another cyanide-containing polish for their silver.

One woman, whose work entails considerable traveling, reported having suffered twelve different attacks during a year while stopping at hotels in various cities. Some hotels have already reported that attacks of similar illness among their guests have ceased to occur since this type of silver polish has been discarded.

Science News-Letter, August 10, 1929

The Densest Star

Astronomy

WILLEM J. LUYTEN in *The Pageant of the Stars* (Doubleday, Doran):

The companion to Sirius gives 400 times less light than the sun, and has been shown, from observations made with the spectroscope, to be much hotter on the surface than the sun. Thus it gives more light per square inch than the sun, and from its low total luminosity we calculate that it must be a very small body, not any larger in size than the planet Uranus. On the other hand, we have ascertained that it weighs almost as much as the sun. From the combination of its size and its weight we derive its density and find the amazingly high figure of 27,000 times that of water. This remarkable star is made of such exceedingly dense material that one cubic inch of it weighs about half a ton; it is 1,500 times as heavy as gold! Strangely enough, however, when we examine its light in the spectroscope we find that in the outside layers of the star hydrogen abounds, the lightest of all gases, ten thousand times lighter than water. The explanation? Quite simple, if we only stop to consider that all matter, as the latest physical theories maintain, is really full of holes. Hydrogen, the simplest form of matter, is made up of a very small, and very heavy, central particle, the *proton*, around which revolves another, much lighter particle, the *electron*, the combination forming a miniature planetary system. Other chemical elements, though more complicated, are essentially built up of combinations of protons and revolving electrons.

Under ordinary circumstances these multitudes of electrons whirl around the central core so fast that they set up a barrier through which nothing can penetrate, with the result that the size of a particle of matter is determined by the size of the largest orbit of the electrons. Under normal conditions the size of the smallest particle of hydrogen, of an *atom* of hydrogen, is about four one-billionths of an inch; consequently, we could never compress hydrogen gas more tightly than by lining up four billion atoms per inch. Compared with the size of such an atom, an electron is again totally insignificant; it is at least 10,000 times smaller, and the whole structure resembles, as Sir Oliver Lodge so felicitously expressed it, "a fly in a cathedral." The best we can do under ordinary circumstances is to compress the atoms until the cathedrals touch; beyond that point we cannot go. Deep in the interior of a star, however, things are different, and conditions are not "normal." Here we meet temperatures of several million degrees, temperatures which have the effect of exciting the electrons into violent agitation, so violent indeed, that instantaneously all the electrons are rudely separated from their protons. The two no longer belong together and each pursues its own destiny, entirely independent of the other; in other words, the walls of the "cathedral" collapse, and all that remain are the "flies." We can begin compressing again, and, instead of finding our limit when the cathedral walls touch, we can now go on until the flies touch; obviously, we can thus attain far greater densities than ever before. Especially, since the walls of the cathedrals were not real walls; they were merely barriers set up by the fast whirling motion of the electrons. In other words, the cathedrals were built of the thinnest tissue paper, the flies made of compressed platinum. Matter under normal, terrestrial conditions is comparable to a city, built of tissue-paper cathedrals touching each other; under the severe strain of the high temperature inside a star the city has collapsed and only the small flies buzzing inside are left. This is, in all probability, what has happened to the faint companion star of Sirius. In its interior the temperature is so high that the electrons and protons have severed their relationship, and the result is a density of 27,000 times that of water.

According to relativity, a star of this extreme density must affect the rays of light emanating from it, since the strong gravitational attraction at its surface makes the light waves indolent; they vibrate slower, and appear shifted toward the red in the star's spectrum. Observations made by Adams at Mount Wilson have indeed borne out this prediction, thus proving not only the correctness of the calculated high density but also of the calculated relativistic deductions.

Science News-Letter, August 10, 1929

The earliest known medicinal use of cinchona bark, from which quinine comes, was in 1638 when the Countess of Chinchon, wife of the governor of Peru, was cured of fever by its administration.

BINDER COVERS

FOR

SCIENCE NEWS-LETTER

Many subscribers have expressed a desire for a convenient binder in which to file their copies of the Science News-Letter. We therefore have prepared an attractive and durable loose-leaf binder-cover of gray leather-like stock, printed in dark green and complete with fasteners. Each binder-cover will hold one volume (six months or 26 issues).

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CLASSIC INVENTIONS:

Edison's Electric Lamp

Light

"Classic Inventions," as a supplement to "Classics of Science," will appear approximately once every four weeks. Its aim, like that of the "Classics of Science," is to reprint accounts of scientific discoveries which everyone has heard of but never seen. Neither series of "Classics" claims to settle any disputes as to priority. Neither claims to use the one, sole and original account of the subject. Nevertheless, as far as possible, the extract chosen gives the author's own account of his discovery, in the light of his vision and his enthusiasm.

Thomas A. Edison, of Menlo Park, New Jersey. ELECTRIC LAMP. Specification forming part of Letters Patent No. 223,898, dated January 27, 1880.

To all whom it may concern:

Be is known that I, THOMAS ALVA EDISON, of Menlo Park, in the State of New Jersey, United States of America, have invented an Improvement in Electric Lamps, and in the method of manufacturing the same, (Case No. 186,) of which the following is a specification.

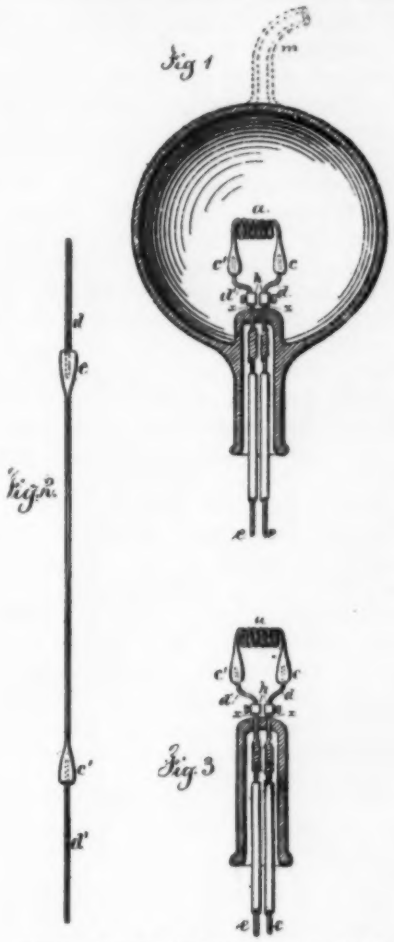
The object of this invention is to produce electric lamps giving light by incandescence, which lamps shall have high resistance, so as to allow of the practical subdivision of the electric light.

The invention consists in a light giving body of carbon wire or sheets coiled or arranged in such a manner as to offer great resistance to the passage of the electric current, and at the same time present but a slight surface from which radiation can take place.

The invention further consists in placing such burner of great resistance in a nearly perfect vacuum, to prevent oxidation and injury to the conductor by the atmosphere. The current is conducted into the vacuum bulb through platina wires sealed into the glass.

The invention further consists in the method of manufacturing carbon conductors of high resistance, so as to be suitable for giving light by incandescence, and in the manner of securing perfect contact between the metallic conductors or leading wires and the carbon conductor.

Heretofore, light by incandescence has been obtained from rods of carbon of one to four ohms resistance, placed in closed vessels, in which the atmospheric air has been replaced by gases that do not combine chemically with the carbon. The vessel holding the burner has been composed of glass cemented to a metallic base. The connection between the leading wires and the carbon has been obtained by clamping the carbon to the metal. The leading wires have always been large, so



THE FIRST ELECTRIC LAMP

that their resistance shall be many times less than the burner, and, in general, the attempts of previous persons have been to reduce the resistance of the carbon rod. The disadvantages of following this practice are, that a lamp having but one to four ohms resistance cannot be worked in great numbers in multiple arc without the employment of main conductors of enormous dimensions; that, owing to the low resistance of the lamp, the leading wires must be of large dimensions and good conductors, and a glass globe cannot be kept tight at the place where the wires pass in and are cemented; hence the carbon is consumed, because there must be almost a perfect vacuum to render the carbon stable, especially when such carbon is small in mass and high in electrical resistance.

The use of a gas in the receiver at the atmospheric pressure, although not attacking the carbon, serves to destroy it in time by "air-washing," or the attrition produced by the rapid passage of the air over the slightly coherent highly heated surface of the carbon. I have reversed this practice. I have discovered that even a cotton thread properly carbonized and placed in a sealed glass bulb exhausted to one millionth of an atmosphere offers from one hundred to five hundred ohms resistance to the passage of the current, and that it is absolutely stable at very high temperatures; that if the thread be coiled as a spiral and carbonized, or if any fibrous vegetable substance which will leave a carbon residue after heating in a closed chamber be so coiled, as much as two thousand ohms resistance may be obtained without presenting a radiating surface greater than three sixteenths of an inch; that if such fibrous material be rubbed with a plastic composed of lamp black and tar, its resistance may be made high or low, according to the amount of lamp-black placed upon it; that carbon filaments may be made by a combination of tar and lamp-black, the latter being previously ignited in a closed crucible for several hours and afterward moistened and kneaded until it assumes the consistency of thick putty. Small pieces of this material may be rolled out in the form of wire as small as seven one-thousandths of an inch in diameter and over a foot in length, and the same may be coated with a non-conducting non-carbonizing substance and wound on a bobbin, or as a spiral, and the tar carbonized in a closed chamber by subjecting it to high heat, the spiral after carbonization retaining its form.

All these forms are fragile and cannot be clamped to the leading wires with sufficient force to insure good contact and prevent heating. I have discovered that if platinum wires are used and the plastic lamp-black and tar material be molded around it in the act of carbonization there is an intimate union by combination and by pressure between the carbon and platina, and nearly perfect contact is obtained without the necessity of clamps; hence the burner and the leading wires are connected to the carbon ready to be placed in the vacuum bulb.

When fibrous material is used the plastic lamp-black and tar are used to secure it to the platina before carbonizing.

By using the carbon wire of such high resistance, I am enabled to use fine platinum wires for leading wires, as they will (*Turn to next page*)

The Future of Heating

Engineering

ERNEST GREENWOOD, in *Prometheus, U. S. A.* (Harper's):

It is only yesterday that our mothers and grandmothers were toiling with the coal range in the kitchen, and the astonishing thing about it is that it took man so long to question its perfection and to say to himself: "There must be something better." The housewife of those days had to be a competent heating engineer if she was to be a good cook. Her knowledge of how to build and keep the fire played quite as important a part in the production of the good things which came on the table as her knowledge of how to prepare and mix the ingredients. Water had to be heated on this range, and the Saturday-night bath was taken in tin or wooden tubs in the kitchen beside it. The only artificial light came from candles or, at best, the kerosene lamp. Refrigerators, electric lights, running water, the gas range, and a host of other conveniences which are commonplace today were unknown.

Then came the gas company with its gas ranges to relieve the housewife from untold drudgery. Kitchens are thought of today in terms of gas ranges. Here was a device by means of which heat for cooking could be had at a moment's notice just when it was wanted, and turned off completely the moment it was no longer needed. No longer was it necessary for the housewife to be a heating engineer—the gas company had relieved her of that obligation. No longer did the kitchen resemble a Turkish bath in summer. This was followed by the gas hot-water heater to take the place of the old coal-range boiler, and coal in the kitchen as direct fuel was gone forever.

In the meantime man was busy with the creation of devices to take the place of the coal range in those districts where gas was not obtainable. Oil ranges and portable oil stoves for heating began to appear on the market, and their manufacture soon became a great industry. Even today this is a thriving industry and literally hundreds of thousands of oil ranges and portable oil heaters are manufactured and sold all over the world every year.

Then man began to turn his attention to house heating. With the constant improvement in coal-burning central plants in the cellar it seemed as though little more could be done. But he resented having thrust upon him continually the machinery by means of which he kept warm—the drudgery of the coal furnace made him say once more to himself: "There must be something" even better, and turned his thoughts to something which would relieve him of it. Experiments in oil-burning devices had been going on for a long time and the gas companies were searching for a type of burner which would enable them to heat the home at a cost which would be within range of the man of moderate means.

Science News-Letter, August 10, 1929

Edison's Lamp—*Continued*

have a small resistance compared to the burner, and hence will not heat and crack the sealed vacuum bulb. Platina can only be used, as its expansion is nearly the same as that of glass.

By using a considerable length of carbon wire and coiling it the exterior, which is only a small portion of its entire surface, will form the principal radiating surface; hence I am able to raise the specific heat of the whole of the carbon, and thus prevent the rapid reception and disappearance of the light, which on a plain wire is prejudicial, as it shows the least unsteadiness of the current by the flickering of the light; but if the current is steady the defect does not show.

I have carbonized and used cotton and linen thread, wood splints, papers coiled in various ways, also lamp-black, plumbago, and carbon in various forms, mixed with tar and kneaded so that the same may be rolled out into wires of various lengths and diameters. Each wire, however, is to be uniform in size throughout.

If the carbon thread is liable to be distorted during carbonization it is to be coiled between a helix of copper wire. The ends of the carbon or filament are secured to the platina leading wires by plastic carbonizable material, and the whole placed in the carbonizing chamber. The copper, which has served to prevent distortion of the carbon thread, is afterward eaten away by nitric acid, and the spiral soaked in water, and then dried and placed on the glass holder, and a glass bulb blown over the whole, with a leading tube for exhaustion by a mercury pump. This tube, when a high vacuum has been reached, is hermetically sealed.

With substances which are not greatly distorted in carbonizing, they may be coated with a non-conducting non-carbonizable substance, which allows one coil or turn of the carbon to rest upon and be supported by the other.

In the drawings, Figure 1 shows the lamp sectionally. *a* is the carbon spiral or thread. *c c'* are the thickened ends of the spiral, formed of the plastic compound of lamp-black and tar. *d d'* are the platina wires. *h h* are the clamps, which serve to connect the platina wires, cemented in the carbon, with the leading-wires *x x*, sealed in the glass vacuum-bulb. *e e* are copper wires, connected just outside the bulb to the wires *x x*. *m* is the tube (shown by dotted lines) leading to the vacuum pump, which, after exhaustion, is hermetically sealed and the surplus removed.

Fig. 2 represents the plastic material before being wound into a spiral.

Fig. 3 shows the spiral after carbonization, ready to have a bulb blown over it.

I claim as my invention—

1. An electric lamp for giving light by incandescence, consisting of a filament of carbon of high resistance, made as described, and secured to metallic wires, as set forth.

2. The combination of carbon filaments with a receiver made entirely of glass and conductors passing through the glass, and from which receiver the air is exhausted, for the purposes set forth.

3. A carbon filament or strip coiled and connected to electric conductors so that only a portion of the surface of such carbon conductors shall be exposed for radiating light, as set forth.

4. The method herein described of securing the platina contact-wires to the carbon filament and carbonizing of the whole in a closed chamber, substantially as set forth.

Signed by me this 1st day of November, A. D. 1879.

THOMAS A. EDISON.

Witnesses:

S. L. GRIFFIN,

JOHN F. RANDOLPH.

Science News-Letter, August 10, 1929

FIRST GLANCES AT NEW BOOKS

LABORATORY AND FIELD ECOLOGY—V. E. Shelford—*Willilams and Wilkins* ($10). The contributions of Prof. Shelford to the developing science of physiological animal ecology are known to all biologists. In this book he undertakes a comprehensive statement of the problems in his field and of the methods of attack as developed by himself and others. The volume therefore becomes a sort of ecologists' bible, without which even the most condensed laboratory or field station library can hardly be reckoned as complete. The bibliography of 1012 titles itself makes the book worth acquiring.

Ecology
Science News-Letter, August 10, 1929

A BIOLOGICAL SURVEY OF THE ERIE-NIAGARA SYSTEM—*State of New York: Conservation Department.* An exhaustive study of the fisheries of one of the most important lake and river systems in this country, with special consideration of the ecological factors involved.

Ecology
Science News-Letter, August 10, 1929

SYNOPSIS AND DESCRIPTION OF NORTH AMERICAN TADPOLES—A. H. Wright—*Govt. Printing Office.* A great deal of taxonomic work has been done on adult batrachians, but to date the capturer of an unfamiliar larval form has not been able to find much comfort in the literature. For this reason Prof. Wright's brochure should receive a wide welcome.

Zoology
Science News-Letter, August 10, 1929

MAMMALS FROM CHINA IN THE COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM—A. B. Howell—*Govt. Printing Office.* The National Museum has accumulated from various sources a collection of Chinese mammals that is large and of extreme interest; it is therefore very much worth while to have this summary.

Zoology
Science News-Letter, August 10, 1929

THE FORAMINIFERA OF THE ATLANTIC OCEAN: PART 6, MILIOLIDAE, OPHTHALMIDIIDAE AND FISCHERINIDAE—J. A. Cushman—*Smithsonian.* Of interest to systematists, oceanographers, students of the plankton, etc.

Protistology
Science News-Letter, August 10, 1929

CASE STUDIES BEARING UPON SURVIVAL—John F. Thomas—*Boston Society for Psychic Research* ($1.50). The report of twenty-four cases and four sittings, in which mediums describe people and places of personal interest to the investigators. The author of the report states: "I do not believe that the evidence so far secured is sufficient proof, but I do believe that it points toward survival and limited return." It is to be regretted that such investigations never seem possible under the controlled conditions that would make the results stand as demonstrated facts, for or against the hypothesis.

Psychic Research
Science News-Letter, August 10, 1929

CHIPPEWA CUSTOMS—Frances Densmore—*U. S. Govt. Printing Office.* A readable account of one of the most picturesque of the Indian tribes. Miss Densmore, who is best known for her success in studying Indian music, has here branched out to report on the food customs, clothing, games, industries, health measures, war customs, and, in fact, practically every aspect of tribal life. Considerable space is given to childhood, a subject not often stressed in such reports. More than one hundred illustrations add to the usefulness of the volume.

Ethnology
Science News-Letter, August 10, 1929

OBSERVATIONS ON THE THUNDER DANCE OF THE BEAR GENS OF THE FOX INDIANS—Truman Michelson—*Government Printing Office.* A detailed report of a secret Indian ritual which involved the sacrifice of boiled puppies. Dr. Michelson obtained and translated two accounts of the ceremony, originally written in the old language of the tribe.

Ethnology
Science News-Letter, August 10, 1929

BODILY CHANGES IN PAIN, HUNGER, FEAR, AND RAGE—Walter B. Cannon—*Appleton* ($3). A new and enlarged edition of Dr. Cannon's famous work on the physiological processes of the emotions. In addition to bringing his material up to date, with the insertion of many new experiments and comments, the author has added a new subject, thirst. And here, too, he presents in permanent book form his theory of the emotions.

Physiology
Science News-Letter, August 10, 1929

L'ENSEIGNEMENT MÉDICAL EN FRANCE—*La Presse Médicale.* For the benefit of foreign physicians and medical students in France, *La Presse Médicale,* leading French medical journal, and L'Association pour le Développement des Relations Médicales have issued this bulletin which lists and describes the leading hospitals, clinics, medical schools and similar teaching centers of France. The entrance requirements and system of examination at certain of the institutions are also given. The book, although written in French, should be of great help to that growing body of physicians and medical students who are spending a year or more in foreign study.

Medical Education
Science News-Letter, August 10, 1929

RESEARCH STUDIES OF THE STATE COLLEGE OF WASHINGTON—Harold St. John, Arthur Eilert Drucker, Charles A. Langworthy—*State College of Washington* (75c). The results of research at the State College of Washington will in a large measure be presented through this new serial.

General Science
Science News-Letter, August 10, 1929

AMERICAN STANDARDS YEAR BOOK 1929—*American Standards Association.* "Standardization is dynamic, not static. It means, not to stand still, but to move forward together." The truth of this statement is upheld in this annual summary of standardization in America.

General Science
Science News-Letter, August 10, 1929

THE TEACHING OF MODERN FOREIGN LANGUAGES IN THE UNITED STATES—Algernon Coleman—*Macmillan* ($1.50). A report of the Modern Foreign Language Study relating to the major problems of modern language teaching in this country.

Education
Science News-Letter, August 10, 1929

A GENERIC REVISION OF THE FOSSORIAL WASPS OF THE TRIBES STIZINI AND BEMBICINI WITH NOTES AND DESCRIPTIONS OF THE NEW SPECIES—J. B. Parker—*Govt. Printing Office.* Prof. Parker has cleared up the taxonomic situation in a troublesome corner, for which students of the hymenoptera will render him due thanks.

Entomology
Science News-Letter, August 10, 1929

Saturn Only Planet in August Skies

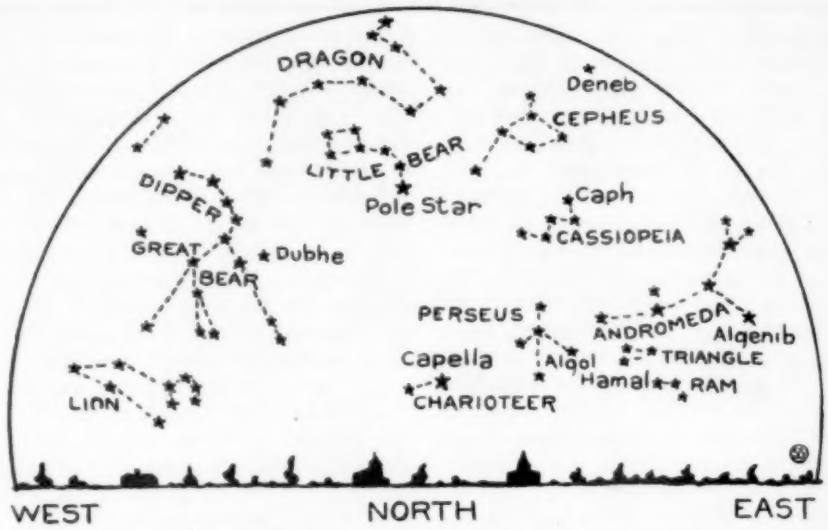
Astronomy

By James Stokley

The chief astronomical attraction of the August evening skies are the Perseid meteors, which reach their maximum on August 11 and 12, though some are seen even later. In the Science News-Letter for last week full directions were given for observing them.

So far as the other attractions of the August sky are concerned, the program is rather slim. Most of the planets have departed from the evening sky, and only Saturn remains in the evening sky for more than a brief period after sunset. Mars is in the constellation of Virgo, and sets about an hour after the sun, but Saturn is in Scorpio, not far from the red star Antares, and does not set until about midnight.

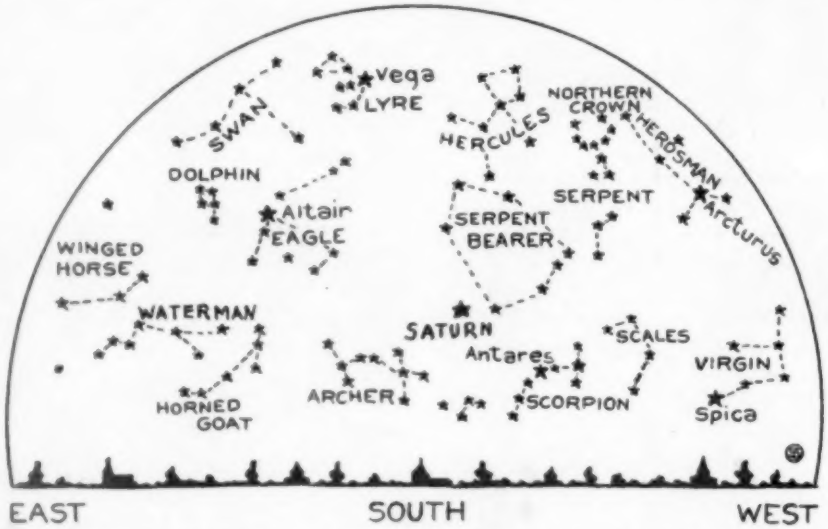
Now we are in the midst of the "dog days", when dogs are supposed to go mad. This name has an astronomical origin, for the name dates from the ancient priest astrologers. As Sirius, the so-called "dog star," is the brightest of all the stars in the heavens, it was watched with special attention. Early in July it set just after the sun and then in August it rose just before sunrise. This time of year was especially important to the Egyptians, for then the Nile overflowed and watered their crops, so the priests anxiously watched for the morning rising of Sirius as a signal. And as the star then mingled its own light with that of the sun, is was supposed this additional radiation was responsible for the heat of this time of year, when dogs, so common in oriental countries, are apt to go mad.



To the unaided eye, Saturn appears merely as a star of the .5 magnitude, a little fainter than Arcturus, the bright star in Bootes, in the western sky. Its steady, untwinkling light distinguishes it from the star. But through even a small telescope, magnifying perhaps 30 or 40 times, the wonderful ring system that makes this planet unique, as far as we know, among celestial bodies, becomes apparent.

Through a large telescope, the sight is even more wonderful, and no one should lose the opportunity of seeing it. In a number of parts of the country great telescopes are opened regularly on certain nights for visitors. Every Friday evening the great 60-inch reflector of the Mount Wilson Observatory in California is open to visitors. This is reached by stage in a few hours from Los Angeles. At the Lick Observatory, on Mount Hamilton, near San Jose, California, the 36-inch refractor is dedicated to visitors' use every Saturday evening. The 72-inch reflector at Victoria, B. C.; the 20-inch refractor at Denver, Colorado; the telescopes at Northwestern University, Evanston, Ill.; Drake University, Des Moines; Chabot Observatory, Oakland, California; Lowell Observatory, Flagstaff, Arizona; Allegheny Observatory, Pittsburgh, Pa.; Swarthmore College, Swarthmore, Pa.; University of Pennsylvania, Philadelphia, Pa.; the U. S. Naval Observatory, Washington, D. C., and many others, are all regularly set aside for the visitors to look through. So no matter what part of the country you are in, there is probably a large telescope near you, and you may be assured that the astronomers there will welcome you on their public nights. A number of these institutions require that visitors obtain tickets (free) in advance, in order that they will not be overcrowded, so it would be best to write for details before making a visit. Some of the university observatories are closed to visitors in summer.

Five stars of the first magnitude are present this month in the evening sky. Vega, in Lyra, the Lyre, is nearly overhead. To the west is Arcturus, already mentioned. To the east of Vega is Deneb, in Cygnus, the Swan, or "northern cross", and to the southeast can be seen Altair, in Aquila, the Eagle. Low in the south is the brilliant red Antares, eye of the Scorpion, Scorpio.



THESE MAPS show the sky as it appears these August evenings. Just hold them in front of you as you face north or south, and the upper or lower will represent the stars you see on a clear night

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